

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (currently amended): ~~Programming~~ A programming system for ~~a robot, or similar~~ an automatic apparatus, bearing a tool-(4), the system comprising a control unit-(5), operative to control movements of the ~~robot apparatus~~ (1) according to multiple axes, and a portable programming terminal (6)-operatively connected to the control unit-(5), where the terminal (6)-comprises

[[-]] selection means-(18), able to be operated manually to select a desired co-ordinate system among a plurality of co-ordinate systems (“Base”, “Tool”, “Joints”) stored in the control unit-(5);

[[-]] first motion control means whose operation depends on a selection made through the selection means-(18), the first motion control means comprising a plurality of motion keys (14) able to be operated manually to provide the control unit (5)-with a respective command signal for the ~~robot apparatus~~ (1), the command signal being aimed at causing the tool (4)-to execute a rotation or a translation motion about or along an axis corresponding to the operated motion key (14), in the co-ordinate system (“Base”, “Tool”, “Joints”) selected using the selection means-(18),

[[-]] position teaching means-(21), able to be operated manually to store a position reached by a predefined point (TCP) of the tool (4)-as a result of a motion of the ~~robot apparatus~~ (1),

~~characterised in that~~ wherein the terminal (6) further comprises additional motion control means (40, 41), able to be operated manually instead of the first motion control means (14), to provide the control unit (5) with a respective signal for controlling the ~~robot~~ apparatus (1) aimed at causing a displacement of the predefined point (TCP) of the tool (4) relative to a previously set reference point (CO), where

[[-]] the position of the reference point (CO) is capable of being modified,

[[-]] the terminal (6) comprises means (D; T) for modifying the position of the reference point (CO),

[[-]] the signal for controlling the ~~robot~~ apparatus (1) generated as a result of the operation of the additional motion control means (40, 41) is independent from the co-ordinate system ("Base", "Tool", "Joints") selected through the selection means (18).

2. (currently amended): ~~System~~ The system as claimed in claim 1, ~~characterised in that~~ wherein the reference point (CO) is representative of ~~the~~ a position of the terminal (6), and hence of a user (7) who supports it the terminal (6), relative to the ~~robot~~ apparatus (7).

3. (currently amended): ~~System~~ The system as claimed in claim 1, ~~characterised in that~~ wherein the additional motion control means (40, 41) are able to be operated to cause Cartesian displacements of the predefined point of the tools (TCP) relative to the set reference point (CO).

4. (currently amended): ~~System~~ The system as claimed in claim 1, ~~characterised in that wherein~~ the additional motion control means (40, 41) can be operated to cause angular or rotary displacements about a respective axis of the predefined point of the tools ~~(TCP)~~.

5. (currently amended): ~~System~~ The system as claimed in claim 2, ~~characterised in that wherein~~ the additional motion control means (40, 41) can be operated to cause a displacement of the predefined point of the tool ~~(TCP)~~ closer, farther away, to the right, to the left, upwards or downwards relative to the position of the terminal ~~(6)~~, and hence of the user who supports it ~~(7)~~ the terminal (6).

6. (currently amended): ~~System~~ The system as claimed in claim 5, ~~characterised in that wherein~~ the additional motion control means (40, 41) comprise a compass knob (40) able to be selectively operated in four lateral areas thereof to cause, in ~~one of its~~ an operating ~~modes~~ mode, a displacement of the predefined point of the tool ~~(TCP)~~ closer, farther away, to the right or the left relative to the position of the terminal (6).

7. (currently amended): ~~System~~ The system as claimed in claim 5, ~~characterised in that wherein~~ the additional motion control means (40, 41) comprise a dual pressure key (41), able to be operated selectively at its two end areas thereof to cause, in an operating mode ~~thereof~~, a displacement of the predefined point of the tool ~~(TCP)~~ upwards or downwards relative to the position of the terminal ~~(6)~~.

8. (currently amended): ~~System~~ The system as claimed in claim 2, ~~characterised in that wherein~~ the additional motion control means (40, 41) can be operated to cause a rotation of the predefined point of the tool (TCP) about a respective axis, counter clockwise or clockwise to the right, counter-clockwise or clockwise towards the position of the terminal (6) and counter-clockwise or clockwise upwards.

9. (currently amended): ~~System~~ The system as claimed in claim 6, ~~characterised in that wherein~~ the compass knob (40) can be selectively operated in four lateral areas ~~thereof~~ to cause, in an additional operating mode, a displacement of the predefined point of the tool (TCP) about a respective axis, counter-clockwise and clockwise to the right and counter-clockwise and clockwise towards the position of the terminal (6).

10. (currently amended): ~~System~~ The system as claimed in claim 7, ~~characterised in that wherein~~ the dual pressure key (41) can be selectively operated at two end areas thereof to cause, in an additional operating mode, a rotation of the predefined point of the tool (TCP) about a respective axis, counter-clockwise or clockwise upwards.

11. (currently amended): ~~System~~ The system as claimed in claim 1, ~~characterised in that wherein~~ the terminal (6) comprises a display device (D) and in that the means (D; T) for modifying the position of the reference point (CO) comprises an information input page capable of being displayed on the display device (D).

12. (currently amended): ~~System~~ The system as claimed in claim 1, ~~characterised in that wherein~~ the means (D; T) for modifying the position of the reference point (CO) comprise at least a first key (20, 24) of the terminal (6).

13. (currently amended): ~~System~~ The system as claimed in claim 12, ~~characterised in that wherein~~ the means (D; T) for modifying the position of the reference point (CO) comprise a display device (D) of the terminal (6) and means for generating graphic information on the display device (D), the graphic information being representative of the position of the reference point (CO) relative to the ~~robot~~ apparatus (1).

14. (currently amended): ~~System~~ The system as claimed in claim 13, ~~characterised in that wherein~~ the means for generating graphic information comprise

[[-]] means for generating on the display (D) a first symbol (CO), representative of the reference point,

[[-]] means for generating on the display (D) a second symbol (PR), representative of the ~~robot~~ apparatus (1);

[[-]] means for moving the first symbol (CO) relative to the second symbol (PR) using the first key (20), ~~in particular along a substantially circular trajectory (TC).~~

15. (currently amended): ~~System~~ The system as claimed in claim 2, ~~characterised in that wherein~~ the means (D; T) for modifying the position of the reference point (CO) are part of a system (T, R) for the automatic recognition of the angular position of the terminal (6) relative to the robot (1).

16. (currently amended): ~~System~~ The system as claimed in claim 15, ~~characterised in that wherein~~ the automatic recognition system (T, R) comprises signal emitter means (T) and signal receiving means (R), the signal emitter means (T) being operatively associated to one ~~between of~~ the terminal (6) and the ~~robot~~ apparatus (1) and the signal receiver means (T) being operatively associated to the other ~~between of~~ the terminal (6) and the ~~robot~~ apparatus (1).

17. (currently amended): ~~System~~ The system as claimed in claim 1, ~~characterised in that wherein~~ the terminal (6) comprises a longitudinally extended body defining a first portion (10) and a second portion (11) having an area of union to the first portion (10), the width of the second portion 811 being progressively decreasing until reaching the union area.

18. (currently amended): ~~System~~ The system as claimed in claim 17, ~~characterised in that wherein~~ in correspondence with a front side of the first portion (10) is provided a display device (D) and in correspondence with a front side of the second portion (11) is provided a multiplicity of keys.

19. (currently amended): ~~System~~ The system as claimed in claim 18, ~~characterised in that wherein~~ the additional motion control means (40, 41) are positioned in a central part of the second portion-(14).

20. (currently amended): ~~System~~ The system as claimed in claim 18, ~~characterised in that wherein~~ the first motion control means comprise a first series of motion keys (14) and a second series of motion keys (14), the two series being positioned in substantially symmetrical fashion, each along a respective longitudinal side of the second portion-(14).

21. (currently amended): ~~System~~ The system as claimed in claim 20, ~~characterised in that wherein~~ the first series consists of keys for controlling translation movements and the second series consists of keys for controlling rotation movements.

22. (currently amended): ~~System~~ The system as claimed in claim 20, ~~characterised in that wherein~~ the additional motion control means (40, 41) are positioned between the first and the second series of motion keys (14).

23. (currently amended): ~~System~~ The system as claimed in claim 1, ~~characterised in that wherein~~ the terminal (6) comprises a safety device of the “dead man” type (13).

24. (currently amended): ~~System~~ The system as claimed in claim 23, ~~characterised in that wherein~~ the terminal (6) comprises a body in whose rear part is defined a longitudinally

extended recess (12), from each of the two opposite longitudinal sides of the recess (12) projecting towards the interior of the recess an elongated button (13), each elongated button (13) being part of the safety device.

25. (currently amended): ~~System~~ The system as claimed in claim 18, ~~characterised in that wherein~~ said multiplicity of keys comprises one or more keys selected in the group consisting of:

[[-]] at least a key (15) for varying the translation velocity of the robot (1), positioned substantially in the right part of the second portion (11), towards the centre thereof;

[[-]] a key (16) for starting a sequence of motions of the robot (1), positioned in the right part of the second portion (11), towards the centre thereof;

[[-]] a key (17) for stopping a motion of the robot (1), positioned in the right part of the second portion (11), towards the centre thereof;

[[-]] a key (18) for selecting a desired co-ordinate system among a plurality of co-ordinate systems, positioned in the left part of the second portion (11), towards the centre thereof;

[[-]] a repetition key (19), which, when pressed, causes the robot (1) to trace back one or more previously executed motions, positioned in the right part of the second portion (11), towards the centre thereof;

[[-]] a key (26) for commanding the execution of individual steps of a previously set sequence of motions of the robot (1), positioned in the right part of the second portion (11), towards the centre thereof;

[[-]] a plurality of programming keys (~~20-23~~) positioned in the left part of the second portion (~~11~~) and comprising at least multiple cursor keys (~~20~~), a data recording key (~~21~~), a data modification key (~~22~~);

[[-]] a plurality of keys of an alphanumeric keypad (~~23~~) positioned in a central part of the second portion (~~11~~).

26. (currently amended): ~~System~~ The system as claimed in claim 18, ~~characterised in that wherein~~ in the first portion (~~10~~), laterally to the display device (~~D~~), are positioned one or more keys selected within the group consisting of:

[[-]] at least two keys (~~24, 25~~) for selecting or navigating among options of a menu able to be displayed on the display device (~~D~~), one of said keys being vertically offset relative to the other;

[[-]] a help key (~~28~~) for obtaining help information on the display device (~~D~~);

[[-]] a plurality of function keys (~~TF1, TF2, TF3~~).

27. (currently amended): ~~System~~ The system as claimed in claim 18, ~~characterised in that wherein~~ in correspondence with an end area of the first portion (~~11~~) are positioned a key selector (~~31~~) and a mushroom head safety push-button (~~32~~).

28. (new): The system as claimed in claim 1, wherein the automatic apparatus includes a robot.